

SCALY-LEG (KNEMIDOKOPTIASIS) IN A POPULATION OF EVENING GROSBEAKS

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Scaly-leg, or knemidokoptic mange, is an avian disease of the feet and beak that has been reported to be a serious problem in poultry and cage birds (Poulsen, 1964). The disease apparently occurs infrequently in wild birds, with isolated incidences having been reported in perhaps a score or fewer species (Louis N. Locke, pers. com.).

At a feeding station in Flagstaff, Coconino County, Arizona, we have observed the disease in three wild species: House Sparrow (*Passer domesticus*), Cassin's Finch (*Carpodacus cassinii*), and Evening Grosbeak (*Hesperiphona vespertina*). In each of the first two species, only one incident of scaly-leg was observed. However, for several years substantial proportions of the local resident Evening Grosbeak population have exhibited the disease.

THE DISEASE AND HOST

The symptoms of scaly-leg include the appearance of small to large, light-colored scabs or encrustations on the beak and/or feet of affected birds (Fig. 1). The development of these scabs is caused by the burrowing of mites (*Knemidokoptes* spp., Sarcoptidae; Fig. 2) into epithelial skin layers, which stimulates the proliferation of excess tissue (Herman et al., 1962). The mites create tunnels that end in pouches, within which both adults and larvae may be found in abundance. The presence of the larvae suggests that the mites complete their life cycle on one host (Yunker and Ishak, 1957) and probably continue to live and reproduce on that host until it is dead.

Since early in 1961, we have been recording the daily occurrence and activities of local birds at the feeding station. During this period, we have recorded a marked change in population size and status of the Evening Grosbeak. Prior to 1963, this species was not observed on a regular basis in the Flagstaff area and was considered by Phillips et al. (1964) to be an erratic and uncommon summer resident in northern Arizona. In February 1964, a flock of about 60 birds took up residence in the pine (*Pinus ponderosa*) forest near the feeding station. Since that time, the Evening Grosbeak has become established in the Flagstaff area as a permanent resident, increasing in total population density at the feeders yearly (see Carothers et al., 1970, 1973). Erratic and irregular invasions occur for many species of birds in response to a variety of natural and/or man-made causes. In this case, the availability of generous and continuous supplies of sunflower seeds, pinyon nuts, millet, and meal worms (Tenebrionidae) at the feeding station were the apparent stimulus for the Evening Grosbeaks to take up residency in the vicinity and to remain throughout the last ten years.

RESULTS AND DISCUSSION

During the spring of 1964, we observed that a very high frequency of scaly-leg occurred among the 60 invading grosbeaks. At this time, it was



FIG. 1. Scaly-leg or knemidokoptic mange in Evening Grosbeaks. A, adult male, heavy infestation, all claws and toes and portions of the lower foot have fallen off; B, adult female, moderate-heavy infestation, note the relatively elongated claws indicating lack of use; C, normal adult female. Photograph by M. Gaede.

estimated that 25 percent of the individuals in the flock had foot abnormalities. The next available detailed records (1967) revealed the disease in 14 percent of the 90 to 95 birds that established residency that year. From 1968 to 1972 no detailed records were kept as to the frequency of the disease, although daily population counts of the Flagstaff flock were continued during the period.

During the early spring of 1973, a concentrated effort was made to band all Evening Grosbeaks that visited the feeding station, using U.S. Fish and Wildlife Service bands. From March through July, 702 adult Evening Grosbeaks were banded and released. An additional 52 individuals (seven percent of the total captured) displayed varying stages of diseased feet and were removed from the population. We estimated that approximately 150 to 200 grosbeaks escaped capture, indicating a probable total spring population of 900 to 950 individuals.

Macro- and microscopic examinations of the diseased birds captured that spring (Fig. 1 and 2) demonstrates conclusively that the disease is caused by the mite, *Knemidokoptes* sp., and not a fungus as previously reported (Carothers et al., 1973).

In the diseased grosbeaks that we have observed, only one case was found in which the beak was affected. This individual was an immature with a quite small (5×5 mm) nodule of the exudate on the upper mandible. In all other cases, the disease was confined to the feet and unfeathered tarsometatarsus. The lesions typically began to form on the proximal end of the tarsometatarsus and extended distally until the entire foot and exposed leg were encrusted with the thick exudate. In many cases, the disease developed to such a degree that portions of the foot were caused to break off and the birds had much difficulty in walking and perching.

Birds with very advanced cases were forced to use the entire ventral

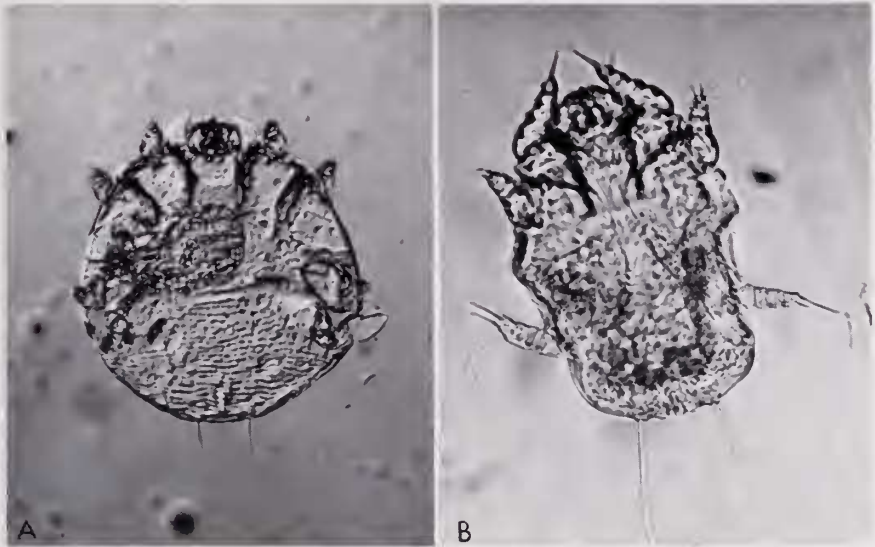


FIG. 2. Photomicrographs of the mite (*Knemidokoptes* sp.) responsible for the disease scaly-leg. A, adult ($\times 250$); B, larval stage ($\times 400$). Photomicrographs by N. J. Sharber.

surface of the tarsometatarsus for supporting their weight, while curling the badly deformed feet up toward the body. In such cases, if the feet were still intact, the claws became greatly elongated from lack of use. The birds characteristically became very subordinate at the feeders; when attacked by other grosbeaks, the former chose to fly short distances, rather than to simply hop away in the manner of non-diseased subordinate birds. Although birds displaying advanced stages of the disease were severely limited in walking and perching ability, none exhibited any serious physiological consequences of having contracted scaly-leg. For example, no significant difference was found between the body weights of healthy and diseased grosbeaks captured during the spring of 1973. Healthy birds had an average body weight of 59.1 ± 0.5 g ($n = 199$) while diseased birds had an average body weight of 58.0 ± 1.3 g ($n = 27$). Also, a comparison of the ratios of gonad weight to body weight among birds captured during the month of May demonstrated no significant difference between the two groups.

The origin of the initial population of grosbeaks that arrived in 1964 is impossible to determine. As noted above, the frequency of scaly-leg in resident populations has slowly declined in nine years, from 25 percent in 1964 to about 7 percent in 1973. The causes of that decline are unknown, but it is likely that a major contributing factor has been our practice of re-

moving diseased birds from the population. To our knowledge, this is the first reported incidence of scaly-leg encountered in near epidemic proportions within a population of wild birds.

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